

CLAIMS

2. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:
- (a) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants;
 - (b) a video mosaic generator, coupled to said AV path, for combining the captured images of a first and second of said participants into a mosaic image of said captured images; and
 - (c) a distributed video mosaic generator, coupled to said AV path, for combining a portion of said mosaic image with a captured image of a third of said participants to generate a distributed mosaic image of the captured images of said first, second and third participants,
- whereby said distributed mosaic image can be reproduced at the workstation of at least one of said first, second and third participants.
3. The teleconferencing system of claim 2, further comprising a close-up selector for selecting one of the participants whose image is reproduced in said distributed mosaic image and replacing said distributed mosaic image with the image of said selected participant.

4. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants;
- (b) a video mosaic generator, coupled to said AV path, for combining the captured images of a first and second of said participants into a mosaic image of said captured images, whereby said mosaic image can be reproduced at the workstations of said first and second participants; and
- (c) a close-up selector for selecting one of the participants whose image is reproduced in said mosaic image and replacing said mosaic image with the image of said selected participant,

whereby said mosaic image reproduced at the workstation of said first participant can be replaced by the image of a first selected participant and said mosaic image reproduced at the workstation of said second participant can be replaced by the image of a second selected participant.

5. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data

path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants; and
- (b) an audio summer, coupled to said AV path, for combining the captured audio of a plurality of participants into an audio sum including the captured audio of each of said participants except for a first of said participants, whereby said audio sum can be reproduced at the workstation of said first participant.

6. The teleconferencing system of claim 5 wherein said audio sum is reproduced in stereo.

7. The teleconferencing system of claim 5, further comprising an echo canceler to reduce echo during the reproduction of said audio sum.

8. The teleconferencing system of claim 5, further comprising a video mosaic generator, coupled to said AV path, for combining the captured images of a first and second of said participants into a mosaic image of said captured images.

9. The teleconferencing system of claim 5, further comprising a distributed video mosaic generator, coupled to said AV path, for combining a portion of said mosaic image with a captured image of a third of said participants to generate a distributed mosaic image of the captured images of said first, second and third participants, whereby said distributed mosaic image can be reproduced at the workstation of at least one of said first, second and third participants.

10. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants, said AV path connecting the workstation of a first of said participants at a first location to the workstation of a second of said participants at a second location via a third location; and
- (b) an AV signal switcher at said third location, coupled to said AV path, for receiving and routing said AV signals to a location other than said third location if said AV signals are intended to be processed at said other location,

whereby the video image and spoken audio of said first participant can be routed to said second location, via said third location, and reproduced at the workstation of said second participant.

11. The teleconferencing system of claim 10, further comprising first, second and third codecs at said first, second and third locations, respectively, for compressing said AV signals and decompressing said compressed AV signals, each of said codecs coupled to said AV path, and said third codec coupled to said AV signal switcher, whereby said captured video image and spoken audio of said first participant can be compressed by said first codec at said first location, routed from said first location to said second location via said AV signal switcher without being

decompressed at said third location, decompressed by said second codec at said second location, and reproduced at the workstation of said second participant.

12. The teleconferencing system of claim 10, whereby the video image and spoken audio of said second participant can be routed to said first location, via said third location, and reproduced at the workstation of said first participant.

13. The teleconferencing system of claim 10, wherein said AV path includes dedicated links between said first and third locations and between said third and second locations.

14. The teleconferencing system of claim 10, wherein said AV path includes dial-up connections between said first and third locations and between said third and second locations.

15. The teleconferencing system of claim 10, wherein said AV path supports both dial-up connections and dedicated links between said first and third locations and between said third and second locations.

16. The teleconferencing system of claim 15, wherein said AV path includes a dial-up connection between said first and third locations and a dedicated link between said third and second locations.

17. The teleconferencing system of claim 10, further comprising a video mosaic generator, coupled to said AV path, for combining the captured images of a plurality of said participants into a mosaic image of said captured images.

18. The teleconferencing system of claim 17, further comprising a distributed video mosaic generator, coupled to said AV path, for combining a portion of said mosaic image with a captured image of another of said participants to generate a distributed mosaic image of the captured images of said participants, whereby said distributed mosaic image can be reproduced at the workstation of at least one of said participants.

19. The teleconferencing system of claim 18, further comprising an audio summer, coupled to said AV path, for combining the captured audio of a plurality of participants into an audio sum including the captured audio of each of said participants except for a first of said participants, whereby said audio sum can be reproduced at the workstation of said first participant.

20. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

(a) a data conference manager for managing a data conference during which data can be shared among a plurality of said participants and displayed on the monitors of their respective workstations;

(b) a second network interconnecting said workstations and providing an AV path, logically separate from said data path, for carrying AV signals among said

workstations, said AV signals representing video images and/or spoken audio of said participants;

(c) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants can be reproduced at the workstation of another of said participants; and

(d) a dedicated video display on which said reproduced image can appear.

21. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

(a) a data conference manager for managing a data conference during which data can be shared among a plurality of said participants and displayed on the monitors of their respective workstations;

(b) a second network interconnecting said workstations and providing an AV path, logically separate from said data path, for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants; and

(c) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants can be reproduced at the workstation of another of said participants,

whereby the data path, data network operating system and data network protocol suite of said first network can be utilized by said data conference manager for managing

said data conference and by said AV conference manager for managing said videoconference.

22. The teleconferencing system of claim 21 wherein said first and second networks employ physically separate paths.


23. The teleconferencing system of claim 22 wherein said AV signals are analog signals.

24. The teleconferencing system of claim 21 wherein said AV and data signals are multiplexed on the same physical path.

25. The teleconferencing system of claim 21 wherein said AV and data paths are implemented with unshielded twisted pair wiring.

26. The teleconferencing system of claim 25 wherein said AV path is implemented with the remaining two pairs of an existing four-pair unshielded twisted pair wiring installation two pairs of which implement said data path.

27. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

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- (a) a data conference manager for managing a data conference during which data can be shared among a plurality of said participants and displayed on the monitors of their respective workstations;
 - (b) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants;
 - (c) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants can be reproduced at the workstation of another of said participants; and
 - (d) a capability-adaptive teleconference manager for managing a teleconference among a plurality of participants whereby, if at least one capability of the set of capabilities consisting of audio capture, audio reproduction, video capture, video reproduction, and a workstation with the capability of connecting to said first network, is not available to at least one of said participants, each of said plurality of participants can participate in said teleconference to the extent of the capabilities available to said participant.

28. The teleconferencing system of claim 27 wherein, if the workstations of a first and second of said participants have AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, and the workstation of a third of said participants does not have said AV capture and reproduction capabilities, said teleconference includes a data conference among said first, second and third participants managed by said data conference manager and a videoconference between said first and second participants managed by said AV conference manager.

29. The teleconferencing system of claim 27 wherein, if the workstations of a first and second of said participants have AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, and the workstation of a third of said participants has audio, but not video, capture and reproduction capabilities, said teleconference includes a data conference among said first, second and third participants managed by said data conference manager and a videoconference among said first, second and third participants managed by said AV conference manager, wherein each of said first and second participants can reproduce the image and spoken audio of the other as well as the spoken audio of said third participant, and said third participant can reproduce only the spoken audio of said first and second participants.

30. The teleconferencing system of claim 27 wherein, if the workstations of a first and second of said participants have AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, and a third of said participants participates in said teleconference by telephone, said teleconference includes a data conference among said first and second participants managed by said data conference manager and a videoconference among said first, second and third participants, wherein each of said first and second participants can reproduce the image and spoken audio of the other as well as the spoken audio of said third participant, and said third participant can reproduce only the spoken audio of said first and second participants.

31. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for

capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a data conference manager for managing a data conference during which data are shared among a plurality of said participants and displayed on the monitors of their respective workstations;
- (b) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants;
- (c) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants is reproduced at the workstation of another of said participants;
- (d) a multimedia mail manager for storing, as a multimedia mail message, data and/or AV signals generated at the workstation of a preparing participant, and for forwarding said multimedia mail message to a receiving participant; and
- (e) an integrated teleconference manager for managing a teleconference, including both a videoconference and a data conference between a first and second participant, during which said first participant can use said multimedia mail manager to prepare and send a multimedia mail message, and wherein said videoconference and said data conference can be initiated in either order by either or both of said first or second participants.

32. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said

workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants;
- (b) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants is reproduced at the workstation of another of said participants; and
- (c) a participant locator which associates a first workstation with a first of said participants having a participant identifier, said identifier entered when said first participant logs into said first workstation, whereby a call to initiate a videoconference with said first participant is routed to said first workstation.

33. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a common collaboration initiator for initiating a plurality of types of collaboration among said plurality of participants, said types of collaboration including data conferencing, videoconferencing, telephone conferencing, and the sending of faxes and multimedia mail messages, said common collaboration initiator including

- (i) a participant selector for selecting one or more desired participants from among a plurality of potential participants; and
- (ii) a collaboration type selector for selecting a desired collaboration type from among said plurality of collaboration types.

34. The teleconferencing system of claim 33, wherein said participant selector includes:

- (a) a rolodex selector for selecting one or more desired participants from a first set of said potential participants; and
- (b) a quick-dial selector for selecting one or more desired participants from a second set of potential participants, said second set being a subset of said first set.

35. The teleconferencing system of claim 34, wherein:

- (a) said rolodex selector includes names of the potential participants in said first set; and
- (b) said quick-dial selector includes icons representing the potential participants in said second set.

36. The teleconferencing system of claim 35, wherein said rolodex and quick-dial selectors have associated collaboration type selector buttons representing said collaboration types.

37. The teleconferencing system of claim 36, wherein said rolodex and quick-dial selectors appear in the same window on a workstation monitor.

38. The teleconferencing system of claim 38, wherein said common collaboration initiator can be invoked by a single user action for selecting each of said desired participants, a single user action for selecting said desired collaboration type, and, if said desired collaboration type is not videoconferencing or telephone conferencing, an additional single user action for selecting information to be sent to at least one of said desired participants.

39. The teleconferencing system of claim 38, wherein said common collaboration initiator can be invoked by a single user action for selecting one of said participants and a default collaboration type.

40. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an incoming call acceptance mechanism for detecting an incoming teleconference call at the workstation of a first of said participants and, if said first participant is engaged in an active teleconference call, invoking telephone mode, whereby said first participant is notified of and provided with the option of accepting said incoming teleconference call.

41. The teleconferencing system of claim 40, further comprising:

(a) an incoming call mode selector for selecting a desired incoming call mode from one of an intercom mode and a telephone mode, whereby

(i) if telephone mode is selected or said first participant is engaged in an active teleconference call, said first participant is notified of and provided with the option of accepting said incoming teleconference call, and

(ii) if intercom mode is selected, said incoming call is accepted automatically.

42. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

(a) a teleconference call acceptance detection mechanism for detecting whether a first participant accepted a teleconference call initiated by a second participant; and

(b) a leave word indicator for, if said first participant did not accept said teleconference call, generating a message at the workstation of said first participant indicating that said second participant attempted to call said first participant.

43. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying

visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an incoming call detection mechanism for detecting, during a first videoconference call between a first and second of said participants, an attempt by a new caller to initiate a second videoconference call to said second participant, and for notifying said second participant that said new caller is attempting to call said second participant; and
- (b) an incoming call acceptance mechanism for placing said first videoconference call on hold and accepting said second videoconference call.

44. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a remote participant hold selection mechanism for placing on hold, in a videoconference call among a hold-activating participant and a plurality of other participants, at least one of said other participants.

45. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying

visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a remote participant disconnection mechanism for disconnecting, in a teleconference call among a disconnecting participant and a plurality of other participants, at least one of said other participants.

46. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an add participant selection mechanism for selecting a new participant from among a plurality of potential participants and adding said new participant to an active teleconference call.

47. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data

path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an incoming call detection mechanism for detecting, during a first teleconference call between a first and second of said participants, an attempt by a new caller to initiate a second teleconference call to said second participant, and for notifying said second participant that said new caller is attempting to call said second participant; and
- (b) an incoming call acceptance mechanism for adding said new caller to said first teleconference call.

48. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a teleconferencing manager for managing a teleconference among said plurality of participants, wherein at least one of said participants can be a multimedia service either providing audio and/or video signals to be reproduced at the workstation of another of said participants or receiving video images and/or spoken audio of said other participant.

49. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for

capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV path for carrying AV signals among said workstations, said AV signals representing video images and/or spoken audio of said participants;
- (b) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants can be reproduced at the workstation of another of said participants;
- (c) a multimedia mail manager for storing, as a multimedia mail message, AV signals generated at the workstation of a preparing participant, and for forwarding said multimedia mail message to a receiving participant; and
- (d) a multimedia conference recorder for recording the AV signals representing the video images and spoken audio of said participants during said videoconference,

whereby said AV path carries the AV signals generated during said videoconference, recorded by said multimedia conference recorder, and included in said multimedia mail message.

50. The teleconferencing system of claim 49, further comprising:

- (a) an AV storage server for storing AV signals prepared by said multimedia mail manager or recorded by said multimedia conference recorder, wherein
 - (i) said AV signals carried from said workstations to said AV storage server can be either analog or digital signals;
 - (ii) said AV signals carried from said AV storage server to said workstations can be either analog or digital signals; and

(iii) said AV signals can be stored in said AV storage server either as analog or digital signals.

51. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a data conference manager for managing a data conference during which data are shared among a plurality of said participants and displayed on the monitors of their respective workstations, said data conference controller including
 - (i) capture tools for capturing said data to be shared, and
 - (ii) annotation tools for annotating said captured data; and
- (b) a multimedia mail manager for preparing and storing, as a multimedia mail message, data generated at the workstation of a preparing participant, and for forwarding said multimedia mail message to a receiving participant, whereby said multimedia mail message is prepared using said capture and annotation tools.

52. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data

path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV conference manager for managing a videoconference during which the video image and spoken audio of a first of said participants is captured at the workstation of said first participant and reproduced at the workstation of a second of said participants; and
 - (b) a multimedia mail manager for preparing and storing, as a multimedia mail message, the video image and spoken audio generated and captured at the workstation of a preparing participant, and for forwarding said multimedia mail message to a receiving participant and reproducing the captured video image and spoken audio of said preparing participant at the workstation of said receiving participant,
- whereby said AV conference manager and multimedia mail manager use said associated AV capture and reproduction capabilities.

53. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants can be reproduced at the workstation of another of said participants;

- (b) a multimedia mail manager for preparing and storing, as a multimedia mail message, the video image and spoken audio generated at the workstation of a preparing participant, and for retrieving said multimedia mail message for forwarding to a receiving participant;
- (c) a multimedia conference recorder for recording the video image and spoken audio of said participants during said videoconference; and
- (d) an AV file system for storing and retrieving both the video image and spoken audio of said preparing participant and said recorded video image and spoken audio.

54. A teleconferencing system for conducting a teleconference among a plurality of participants having workstations with associated monitors for displaying visual images, and with associated AV capture and reproduction capabilities for capturing and reproducing video images and spoken audio of said participants, said workstations being interconnected by a first network, said network providing a data path for carrying digital data signals among said workstations, the teleconferencing system comprising:

- (a) a data conference manager for managing a data conference during which data are shared among a plurality of said participants and displayed on the monitors of their respective workstations;
- (b) an AV conference manager for managing a videoconference during which the video image and spoken audio of one of said participants can be reproduced at the workstation of another of said participants; and
- (c) a multimedia conference recorder for synchronizing and recording both the video image and spoken audio of said participants during said videoconference and the data shared during said data conference.